REMARKS

Favorable consideration and allowance of the claims of the present application are respectfully requested.

At the outset applicants' indicate the applicants' current co-pending United States application serial number of the paragraph [0046] of the application as filed.

In the present Official Action, the Examiner rejects claims 1, 5, 6, 7, 9, 26, 29, 30 and 31 under 35 U.S.C. 102(b) as being unpatentable over US Patent Pub. No. 2002/0051427 ("Carvey").

Claims 22, 23 and 24 were further rejected under 35 U.S.C. 102(b) as being unpatentable over US Patent No.6,101,181 ("Passint").

Claim 25 was further rejected under 35 U.S.C. 102(b) as allegedly being anticipated by US Patent Pub. No. 2003/0123459 ("Liao").

Claims 2, 3, 27 and 28 were rejected as allegedly unpatentable over Carvey in view of US Patent No. 6,813,643 ("Pearlman").

Claims 8, 32 and 33 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable under 35 U.S.C. 103(a) over Carvey in view of Passint.

Claims 4, 10, 11, 14, 17, 18, and 34 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey in view of US Patent No. 7,173,912 ("Jaber").

Claims 12, 13, 35, and 36 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber in further view of US Patent No. 7,185,077 ("O'Toole").

Claim 15 was rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber in further view of US Patent Pub. No. 2002/0051427 ("Shin I").

Claims 37 and 39 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber and O'Toole in further view of US Patent Pub. No. 2003/0076833 ("Shin II").

Claim 16 was rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber in further view of US Patent No. 6,292,822 ("Hardwick").

Claim 38 was rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber and O'Toole, and in further view "Hardwick".

Claim 19 was rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber in further view of US Patent Pub. No. 2002/0131409 ("Frank").

Lastly, Claims 20, 21 and 40, 41 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Carvey as modified by Jaber in further view of US Patent Pub. No. 2003/0031127 ("Saleh").

With respect to the rejection of claims 1, 5, 6, 7, 9, 26, 29, 30 and 31 under 35 U.S.C. 102(b) as being unpatentable over Carvey, applicants respectfully disagree.

Regarding Claim 1, the Examiner alleges that Carvey's teaching of a Gamma graph fabric requiring one hop to traverse the fabric is a teaching of a one-bounce data network. Applicants respectfully traverse. Carvey concerns a one-hop data network, not a <u>one-bounce</u> data network. At best, Carvey teaches a 'one-hop' network appearing to comprise a plurality of nodes interconnected to each other via communication links, the network including a plurality of interconnected switch devices, the switch devices interconnected such that a message is communicated between any two switches passes over a single link from a source switch to a destination switch. This is the extent of Carvey's teaching.

That is, Carvey does not teach the aspect of the invention as set forth in Claim 1 (and Claim 26), namely, that the source switch concurrently sends a message to an arbitrary bounce switch which then sends the message to the destination switch.

The need for the one-bounce over one-hop concept of the invention is described in the description. For example, paragraph [0027] first describes the deficiencies of one-hop network and its problems: Using the link between two switches is efficient for a single small message. However, using just the link between two switches is not efficient for many other communication patterns. An example of this inefficiency is the simultaneous communication of many messages between the two switches. If just the link between the two switches is used, then the simultaneous messages are communicated at the bandwidth of the single link. All the other links exiting the source switch and all the other links entering the destination switch are idle.

The remainder of Paragraph [0027] and also paragraph [0028] of the present specification then discusses the novel one-bounce solution: The solution to this inefficiency is to allow the source switch to send a message to an arbitrary other switch which then sends the message onwards to the destination switch, i.e., the message is communicated in one-bounce. Figure 3 adds this bounce traffic to the situation illustrated in Figure 2 as shown by the arrow D representing the first message communicated from switch S0 to switch S1 as described with respect to Figure 2 and the concurrent communication of a second message to destination switch S1 over one of switches S2 or S3 over a one bounce path labeled arrow B in Figure 3.

In the one-bounce network configured with switches as depicted in Figure 3, there is enabled simultaneous communication of many messages between any two switches, the one-bounce allows all the links exiting the source switch and the links entering the destination switch to be used. Thus, the simultaneous messages are communicated at the aggregate

bandwidth of all the links to or from a switch. Independent Claims 1 and 26 are being amended to set forth the one-bounce network enabling simultaneous messages to be communicated between the source switch and destination switch up to the aggregate bandwidth of all the links to or from a switch. Respectfully, no new matter is being entered as description of the bandwidth allocation as applied to one-bounce network is described in paragraphs [0028] – [0032] of the present specification. This one-bounce network configuration efficiently supports various communication patterns, including nearest-neighbor and all-to-all where, by construction, each switch is linked to every other switch so that each message crosses only a single link.

In the rejection of Claim 1, the Examiner further alleges in the Office Action that a switch can also forward at least portions of data packets to at least one traffic manager (an arbitrary bounce switch). However, Applicants' respectfully disagree. The traffic manager in Carvey is not an arbitrary bounce switch as in the present invention. For the reasons as will be described in greater detail hereinbelow, Carvey's Traffic Manager is NOT part of the network or fabric. Moreover, a bounce switch of the present invention is a switch in the fabric. Moreover, Carvey is NOT describing bouncing. Instead Carvey is only describing the usual multihop shortest-path passage of a packet through a network.

That is, in Carvey, as explained at paragraph [0051] of the present specification, each access link interconnects a switch 310 to a Traffic Manager 320, which is a component managing the injection and extraction of packets from the network. Carvey's Traffic Manager thus corresponds to an "injection buffer" and "reception buffer", as illustrated in Fig. 7 of the present invention. That is, in the present invention at paragraphs [0042] for example, there is described contents of an exemplary node Q00 of the nine nodes of the example integrated switch element of Figure 6. As shown in Figure 7, each node includes a router device 50, a

processor device 80 and associated memory 70 that injects messages or data into the switch via an injection buffer 55 and receives data received at the node via a reception buffer 60.

Thus, in claim 1, the term 'bounce switch' is intended to be self-explanatory as 'a bounce switch is any switch used to bounce a message from the source switch to the destination switch'. The term 'bounce switch' is explicitly explained in the description. For example, as explained at paragraph [0034] of the present specification, in a packet-based one-bounce network, the restriction of one-bounce can be obeyed by a bit in each packet header indicating whether a packet has already bounced or not. This so-called bounce bit is clear when the packet is injected into the network and is set when the packet is bounced to a switch which is not the destination switch. At this so-called bounce switch, the set bounce bit indicates that the packet only can go to the destination switch.

Thus, regarding the rejection of independent Claim 26, the same arguments submitted herein in the traversal of the rejection of claim 1, applies in applicants' traversal of Claim 26. That is, Carvey does not teach a method for communicating in a one-bounce network of Claim 1. To this end, Claim 26 is being amended to set forth the term <u>arbitrary bounce switch</u> with the term 'bounce switch' having the specific meaning as explained herein.

Regarding claims 5 and 29, the Examiner alleges that Carvey teaches use of a packet being received by the Traffic Manager, which appends . . . a hop count. . . and further equates this to the present invention's recitation in Claim 5 of a packet-based network wherein a packet to be communicated includes means for indicating whether a packet has already bounced or not. In traversal, respectfully, Carvey is NOT describing bouncing. Instead Carvey is only describing the usual multihop shortest-path passage of a packet through a network.

It is noted that a "bounce" as taught in the present invention, is NOT the minimal hop path through a network. Instead a bounce-path is a novel means of making maximal use of the link bandwidth. In order to realize the bounce switch of claim 1, claim 5 is an important technique as it is directed to a packet to be communicated includes means for indicating whether a packet has already bounced or not). The same argument applies to Claim 29 which tracks the language of claim 5.

With specific regard to the rejection of Claim 9, the Examiner confirms that in Carvey, any destination node can be reached by any source node within two hops (Fig 5A and 5B, Carvey). However, again, Carvey is not describing a one-bounce network. As seen in (Fig 5A and 5B, Carvey), any destination node CANNOT be reached by any source node within ONE hop. By contrast, in the one-bounce network of the present invention, having a fabric of diameter = 1 (wherein diameter (D) is defined in Carvey as a maximum number of links (i.e. hops) traversed by a packet from any source to any destination node of the fabric. As Claim 9 depends upon Claim 1, and neither Carvey nor other prior art describes a one-bounce network, claim 9 is novel.

In sum, applicants submit that independent Claim 1 and independent Claim 9, as amended, is not anticipated by Carvey and the Examiner is respectfully requested to withdraw all of the rejections of these claims and Claims 5, 6, 7, 9, 26, 29, 30 and 31 dependent therefrom.

Further in the Office Action, Claims 22, 23 and 24 were further rejected under 35 U.S.C. 102(b) as allegedly being unpatentable over Passint.

Applicants' respectfully disagree in view of the amendments to Claim 22 provided herein. Particularly, Claim 22 is being amended herein to set forth a distributed-memory computer configured as a two-level one-bounce network with the one-bounce level comprising 64 one-bounce nodes with each one-bounce node with a link to every other one-bounce node and with each one-bounce node comprising: a plurality of cards, each card including 64 routers connected as a 4*4*4 torus network, with each router connected to a single node.

Regarding claim 22, Passint has been cited as teaching a computing system having 128 nodes interconnected with 64 router chips in a double bristled torus topology. In short, the office action indicates that a torus fabric is not new and that Passint is an example of prior art. Applicants are in agreement however, Claim 22 is not claiming a torus network; rather, it is claiming a two-level network where one of the levels is a prior art torus network, the other level is the novel one-bounce network as set forth in the newly added recitations to Claim 22 amended for clarity. The Examiner is thus respectfully requested to withdraw the rejection of Claim 22 and dependent Claims 23-24 dependent thereon.

Further in the Office Action, Claim 25 was further rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Liao.

Applicants respectfully disagree. Liao teaches a hardware mechanism for concurrent matching of multiple fields. Yet Claim 25 as elaborated in paragraph [0051] of the present specification and which refers to example binary networks shown in Fig. 9, Fig. 10, and Fig. 11, claims that a multi-level binary one-bounce network can be created. For clarification purposes, Claim 25 is being amended to further set forth that at each level a total number of 2^x routers is provided wherein $x = 2^{(L-1)}$. Liao respectfully does not teach or suggest such a multi-level binary one-bounce network configuration.

It is further noted in the Office Action that Liao further teaches the concept of a Patricia tree. However, applicants' contend that a Patricia tree, like other tree structures has no cycles. As seen in the present invention, e.g., in Fig. 11, the multi-level binary one-bounce network has cycles.

The Examiner is thus respectfully requested to withdraw the rejection of Claim 25.

Further in the Office Action, Claims 2, 3, 27 and 28 were rejected as allegedly unpatentable over Carvey in view of Pearlman. Applicants respectfully traverse as the primary reference to Carvey does not teach the limitations of Claims 1 and 26 as argued above. Notwithstanding this, Perlman teaches the bandwidth allocation, but not bandwidth allocation as applied to one bounce network.

With further regard to the rejection of Claim 3 that Claim 3 describes one operation of a one bounce network, as Carvey and Perlman do not teach the limitations of claims 2 and 27 as applied above, and thus, are distinguishable as being dependent thereon. The Examienr argues however that Carvey teaches a single X12 port can be implemented. While a multi-ported switch known (and Carvey is an example) however, Carvey does not teach or suggest describe a <u>one-bounce network</u> that would enable <u>simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch</u>.

The Examiner is thus respectfully requested to withdraw the rejection of Claims 2, 3 and 27 and 28.

With respect to the rejection of Claims 8, 32 and 33 as allegedly unpatentable under 35 U.S.C. 103(a) over Carvey in view of Passint, applicants disagree. As a preliminary matter, claim 32 is being amended to refer to claim 26, NOT to claim 30 and Claim 33 is being amended to refer to claim 30, NOT to claim 32. Claim 8 shows how the existing

techniques of virtual channels can be used to achieve deadlockfreedom for a one-bounce-network. While deadlock-freedom and virtual channels are taught in Carvey and Passint, as argued above, the one-bounce network is novel. As such achieving deadlock-freedom is not obvious. This is important since a network is of much less use if it is not free of deadlocks.

The Examiner is thus respectfully requested to withdraw the rejection of Claims 8, 32 and 33.

With respect to the rejection of Claims 4, 10, 11, 14, 17, 18, and 34 as allegedly unpatentable over Carvey in view of Jaber, applicants respectfully disagree.

For example, with respect to Claim 4 claiming circuit-switching one-bounce-network, the Examiner alleges that Jaber teaches circuit switch networks. While circuit-switching is prior art and Jaber is an example. But as described above Carvey does not teach a one-bounce network.

With respect to the rejection of Claims 10 and 34 claiming internal and external links implemented in a one-bounce-network, applicants' submit that while internal and external links or interfaces are prior art and (Carvey and Jaber are examples), as described above, Carvey does not teach or suggest describe a <u>one-bounce network</u> that would enable <u>simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch</u>.

Regarding the rejection of Claim 11 claiming differing bandwidths for internal links with respect to a one-bounce-network, and Claim 14 claiming a router serving external links and internal nodes with respect to a one-bounce-network, as Carvey does not teach or suggest describe a <u>one-bounce network</u> that would enable <u>simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch,</u> these claims are patentable.

Regarding claim 17 claiming that for the multiple switches making up a one-bounce network, each switch can internally be implemented as a torus, while a two dimensional torus is known, Carvey does not teach or suggest describe a one-bounce network that would enable simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch.

Regarding claim Claim 18 claiming that for the multiple switches making up a one-bounce network, each switch can internally be implemented using a central switch or multi-staged switch, as Carvey does not teach or suggest describe a one-bounce network that would enable simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch, Claim 18 is patentable.

It is noted that Claims 17 and 18 are being amended to clarify that the switches are part of the plurality of interconnected switches of the one-bounce network.

The Examiner is thus respectfully requested to withdraw the rejection of Claims 4, 10, 11, 14, 17, 18, and 34.

Of the remaining rejected Claims 12, 13, 15, 16, 19-21, 35, and 36 – 41 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable over primary reference to Carvey in view of others. However, as described hereinabove, as the primary reference to Carvey does not teach or suggest describe a one-bounce network that would enable simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch, these claims are patentable over the combinations of Carey and others in view of their dependency.

Of these, the dependencies of Claims 36-39 are being changed.

Further, Claim 16 is being amended for clarification purposes to set forth that the one-bounce network is configured to perform the effective all-to-all performance of the one-bounce network wherein each router has an external link, and is configured with internal links having twice the effective all-to-all bandwidth of the effective all-to-all bandwidth of the external links. Respectfully, no new matter is being entered as full support may be found in the specification, e.g., at paragraph [0043] of the originally filed specification.

With regard to the specific rejections of Claims 20 and 40 concerning unicast messaging in the one-bounce network, and Claims 21, 41 concerning adaptive routing in the one-bounce network, again applicants submit that, as the primary reference to Carvey does not teach or suggest describe a one-bounce network that would enable simultaneous messages to be communicated between the source switch and destination switch at the aggregate bandwidth of all the links to or from a switch, these claims are patentable over the combinations of Carey and others in view of their dependency.

Moreover, respectfully, neither Saleh nor other prior art describes a one-bounce switch and as particularly seen in Fig. 7 of Saleh, any destination node CANNOT be reached by any source node within ONE hop. By contrast, the one-bounce network of the present invention concerns a fabric of diameter 1 (as claim 1 sets forth ". . . said switch devices interconnected such that a message is communicated between any two switches passes over a single link from a source switch to a destination switch. . ").

In view of the foregoing, this application is now believed to be in condition for allowance, and a Notice of Allowance is respectfully requested. If the Examiner believes a telephone conference might expedite prosecution of this case, it is respectfully requested that he call applicant's attorney at (516) 742-4343.

Respectfully submitted,

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